

## ***Interactive comment on “Changes in the Adriatic oceanographic properties induced by the Eastern Mediterranean Transient” by I. Vilibić et al.***

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We appreciate the comments given by Miroslav Gacic, but still defending reliability of our hypothesis presented in the paper and in our reply to Giuseppe Civitarese. Although some of the comments are feasible and will be included in the revision of the manuscript, we do not find a single suggestion for alternative explanation of our results, just a series of “hardly acceptable” statements. Therefore, we read the comments as affirmative for the hypothesis, although being recognized as “a bit speculative” by Anonymous Reviewer #1 – dragging of an intermediate (or below euphotic layer) waters from Western Mediterranean to the Adriatic through the BiOS-EMT induced circulation. We are aware that our hypothesis should be confirmed by further research – in our reply to Giuseppe Civitarese we wrote: “Also, we plan to put the finding more cautiously,

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as hypotheses to be investigated in the future, and not as definite conclusions, as we are aware that the data coverage is not sufficient to provide definitive explanations and conclusions on these processes and topics.”

Our reply to specific comments:

- “The introduction of a completely new water mass in the Ionian which has never been mentioned before in the literature (Western Mediterranean Intermediate Water) cannot be acceptable argument mainly because the Strait of Sicily has depth of about 500 m and thus in a two-layer exchange (inflow of the AW and outflow of the LIW) a possible existence of the important part of the cross section occupied by the WM intermediate layer is hardly acceptable.”

Before 1990s the EMT was never mentioned before (as it didn't occur, or better to say captured by the measurements), however its introduction to the Mediterranean oceanography at that times was not treated as “cannot be acceptable”. New concepts are introduced when the present ones cannot explain experimental findings. Civitarese et al. (2010) also introduced a new concept when explaining the Adriatic ingressions.

Regarding the name of the water mass, we can call it “Western Mediterranean Intermediate Water”, or “Atlantic Water flow below euphotic zone”, or whatever, but our hypothesis is essentially saying that some of the WMed waters with different nutrient characteristics are dragged into the Adriatic, still keeping a footprint visible in nutrient ratios (that doesn't mean that the ratio is conservative). Gasparini et al. (2005) states that the upper layer flow in the Sicily Strait is about 200 m thick, that “The salt content reaches its maximum ( $S = 38.826$ ) during 1992 and is followed by a sudden decrease.”, and “the sudden drop of salinity, together with a concurrent temperature decrease, suggests a massive presence of tEMDW in the deep basin.” tEMDW is the upper deep Ionian water having origin in the Eastern Mediterranean, having the same or very similar N:P ratio as other deep Eastern Mediterranean waters, and therefore not explaining the changes in N:P ratio observed along the Palagruža Sill in mid 1990s.

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Also, we provided a dynamical explanation for that (lagged response of thermohaline circulation) already documented to happen in the Adriatic (Orlić et al., 2007): a peak in dense water outflow generates the peak in inflowing counter-current, lagging the outflow peak for several months. Why this concept cannot be extended to the whole Eastern Mediterranean, as we have the same settings: the EMT-generated strong peak in dense water outflow in 1992 and anti-estuarine circulation in the Sicily Strait?

- "Another aspect of the same argument saying implicitly that the N:P ratio is a conservative property of a water mass in the 115 m depth cannot be accepted either. The authors apply implicitly the same reasoning to the pH i.e. that it is a conservative property of a water mass. Both parameters can hardly be considered conservative due to intense biological activity in the 100-m deep water column."

First, the waters coming from southeast and being dragged at 115 m at the Palagruža Sill are advected from deeper layers due to topographically-induced upwelling at the sill. Secondly, we are not saying that biological activity is not embedded in the data, but only that these water are preserving their nutrient characteristics enough to be recognized as different, by means of statistical analysis (which is now done and will be presented in revised paper, following suggestions provided by Anonymous Reviewer #1). Finally, no other plausible explanations for pH data, N:P ratios and P-salinity correlations came to our mind, and also to mind of G. Civitarese and M. Gacic (at least they did not present them in their comments).

- "Subsequently, authors in citing the paper by Borzelli et al. (2009) say that "Western Mediterranean intermediate waters "were presumably deviated northward by the anticyclonic Ionian gyre together with surface nutrient-depleted waters of Atlantic origin, which extended to depths of about thousand meters ..." the fact that Borzelli et al. (2009) do not state at all."

The word "presumably" is critical here, while Borzelli et al. (2009) discussed the changes in "upper-layer circulation" based on the first 1000 m of measurements - the

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shape of isopycnals in 1995 (their Fig. 3) plus discussion in their Section 12 are suggesting that the cyclonic circulation and reversal in 1997 encompassed the first thousand meters. We will rewrite the sentence and put the reference on right position.

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